



COMMUNITIES

QUICK FACTS

The U.S. Environmental Protection Agency (EPA) has estimated that about 1 in 5 Americans, or approximately 69 million people, live within 4 miles of a hazardous waste site.¹

Community noise exposure acts as an environmental stressor and has been linked to disrupted sleep patterns, increased blood pressure, and mental health impacts in addition to hearing loss.²

Most of the United States is experiencing an overall warming trend, and people living in cities are especially vulnerable to increasing temperatures.³

While environmental contaminants in outside air and drinking water have long been linked to public health outcomes, we continue to learn more about other potential hazards found in neighborhoods, towns, and cities which can contribute to illness, injury, and even death. Exposure to noise, heat, ultraviolet light radiation, and hazardous waste sites threatens the health of people in communities across the nation. Fortunately, the health effects associated with these factors are largely avoidable through awareness and preventive measures.

INTRODUCTION

A healthy community as described by the U.S. Department of Health and Human Services *Healthy People 2010* report is one that continuously creates and improves both its physical and social environments, helping people to support one another in aspects of daily life and to develop to their fullest potential. Healthy places are those designed and built to improve the quality of life for all people who live, work, worship, learn, and play within their borders—where every person is free to make choices amid a variety of healthy, available, accessible, and affordable options. A healthy community environment encompasses aspects of human health, disease, and injury that are determined or influenced by factors in the overall environment. Examining the interaction between health and the environment requires studying not only how health is affected by the direct pathological impacts of various chemical, physical, and biologic agents but also by factors in the broad physical and social environments, which include housing, urban development, land use, transportation, industry, and agriculture.⁴

Other modules in this report address the more well-established environmental health factors, including outdoor air quality, drinking water quality, and food-borne exposures. This module focuses on community environmental health hazards not covered elsewhere in this report, including the following:

- Hazardous Waste Sites
- Noise
- Heat
- Ultraviolet Light Radiation

HAZARDOUS WASTE SITES

Hazardous waste sites comprise a variety of places where substances that are dangerous—or potentially harmful to health or the environment—are or were disposed.⁵ Currently operating facilities that generate, treat, store, or dispose of hazardous waste are required to obtain a permit and follow regulations protecting health and the environment, but some facilities operated before these safeguards were implemented. This section addresses uncontrolled or abandoned hazardous waste sites, which includes the following:

- Former manufacturing and industrial facilities
- Mining and processing plants
- Waste storage and treatment operations
- Other types of sites

Among these are the Superfund sites, which are hazardous waste sites judged to pose the greatest risk to human health and the environment.

EPA/ATSDR Hazardous Substance List¹¹
The Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Priority List of 275 hazardous substances found at Superfund sites is prioritized on the basis of:

1. each chemical's frequency at Superfund sites,
2. known or suspected toxicity, and
3. potential for human exposure. Following are the first 20 substances on the list.

Arsenic
Lead
Mercury
Vinyl chloride
Polychlorinated biphenyls (PCBs)
Benzene
Cadmium
Benzo(a)pyrene
Polycyclic aromatic hydrocarbons (PAHs)
Benzo[b]fluoranthene
Chloroform
Aroclor 1260
DDT (p,p isomer)
Aroclor 1254
Dibenzo[a,h]anthracene
Trichloroethylene (TCE)
Hexavalent chromium
Dieldrin
White phosphorus
Hexachlorobutadiene



Figure 1. Hazardous Waste Sites in the United States, 2013.¹³

WHAT ARE THE POTENTIAL HEALTH EFFECTS OF HAZARDOUS WASTE SITES?

While we continue to learn more about the potential health outcomes associated with hazardous waste sites, many factors complicate our efforts to establish clear links. Evidence to date suggests that some sites could potentially compromise public health. A review of epidemiologic literature reported a possible association between proximity to hazardous landfill sites and both adverse pregnancy outcomes and, to a lesser extent, cancer. The author of this study also noted many biases and confounding factors that preclude the establishment of firm links.⁶ Similar conclusions regarding these health effects have been published by other researchers.^{7,8,9,10}

Given the wide array of substances that can be found at hazardous waste sites, the number of health outcomes is potentially very large if exposure occurs. The most common routes of exposure are through water, air, and food. Sediments and soils also contribute to the associated health risks. The EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) have prepared a list of hazardous substances that pose the most significant potential threat to human health at hazardous waste sites (see sidebar). The ATSDR maintains online toxicological profiles for these and other substances.¹¹

HOW ARE WE TRACKING HAZARDOUS WASTE SITES?

The most comprehensive list of uncontrolled hazardous waste sites in the United States is the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), maintained by the EPA. As of November 2013, the EPA listed 10,183 sites on CERCLIS (Figure 1).¹

State environmental agencies also maintain inventories of hazardous waste sites, including many sites not on the CERCLIS list. A subset of CERCLIS sites has been placed on the EPA's National Priorities List (NPL). The NPL sites, often referred to as Superfund sites, are those judged to pose the greatest risk to human health and the environment. In November 2013, there were approximately 1737 sites on the NPL.¹²

STATUS AND TRENDS FOR HAZARDOUS WASTE SITES

About 1 in 5 Americans, approximately 69 million people, live within 4 miles of a hazardous waste site.¹ However, living near a hazardous waste site does not necessarily involve exposure to hazardous substances.



Table 1. Public health hazard category for 2,118 sites evaluated by ATSDR between 1997 and 2007.¹⁴

Public Health Hazard Category	Number of Sites	Percentage of Sites
Urgent Public Health Hazard	14	0.95%
Public Health Hazard	235	16.0%
Indeterminate Public Health Hazard	502	34.1%
No Apparent Public Health Hazard	432	29.3%
No Public Health Hazard	289	19.6%



Brownfields^{15,16}

Brownfields are abandoned or underused land and/or buildings where redevelopment, expansion or reuse is hindered by the known or potential presence of contamination. These locations generally do not pose a serious public health threat and are therefore not candidates for NPL status, but uncertain liability and the costs of site cleanup present barriers to development. The EPA estimates that there are more than 450,000 brownfields in the United States. Many federal and state programs, such as tax incentives and seed-money grants, have been implemented to encourage brownfield redevelopment.

Since its inception in late 1980, ATSDR has evaluated the potential impact of exposures to environmental contamination from over 4,000 hazardous waste sites, including all sites on the NPL. Between 2007 and 2013, ATSDR conducted comprehensive public health assessments for 1,472 hazardous waste sites. ATSDR concluded that about 23% of these sites posed either an urgent public health hazard or a public health hazard (Table 1).

WHAT YOU CAN DO

Following are suggested actions you can take to minimize your exposure to substances from hazardous waste sites:

- If you use groundwater from wells located near a hazardous waste facility, have your water tested periodically for contaminants, especially if the water tastes or smells unusual.

- Ask local health officials about fish consumption advisories, particularly for fish caught in surface waters near hazardous waste sites or caught in surface waters that might be contaminated by hazardous waste sites upstream.

ADDITIONAL RESOURCES

The ATSDR and EPA have several online sources for information ranging from health effects of hazardous substances to the locations of NPL sites in each state.

- ATSDR's Hazardous Waste Sites page at: www.atsdr.cdc.gov/hazardouswastesites.html
- EPA's Superfund Web site at: www.epa.gov/superfund/index.htm
- ATSDR's "ToxFAQs" at: www.atsdr.cdc.gov/toxfaqs/index.asp

NOISE

Noise is one of the most common environmental hazards with broad community level impact. Today, millions of Americans are subjected to noise caused by automobiles, trucks, airplanes, trains, car alarms, and many other sources. Recreational and day-to-day activities—target shooting and hunting, listening to personal music devices, and using power tools or motorized implements, such as lawnmowers and leaf blowers—expose people to very loud noise that can potentially damage hearing. Although noise has been recognized for almost 80 years as a growing danger to the health and welfare of the nation's population,¹⁷ measures to reduce noise exposure are scattered and uncoordinated, leaving many noise problems unresolved.

WHAT ARE THE HEALTH EFFECTS OF NOISE EXPOSURE?

The most notable health problem caused by noise is hearing loss. Hair cells of the inner ear and the hearing nerve can be damaged by intense sounds, like an explosion, or by continuous or repeated exposure to noise. People of all ages can sustain noise-induced hearing loss. Several government institutes have noted that hearing loss is appearing much earlier in life than would have been expected just 30 years ago.¹⁸ A report based on audiometric testing of 5,249 American children, revealed that 12.5% of the children had noise-induced hearing threshold shifts (dulled hearing) in one or both ears.¹⁹ The National Institute on Deafness and Other Communica-



Table 2. Noise categories and example sources.³⁴

Descriptor	Decibels (dB)	Example sources
Painful	120–150	Firearms, air raid sirens, jet engines, jack hammers, jet plane take-offs, band practice
Extremely loud	90–110	Rock music, snowmobiles, chain saws, lawnmowers, shop tools, truck traffic, subway
Very loud	60–80	Alarm clocks, busy traffic, busy streets, vacuum cleaners, dishwashers

tion Disorders states that approximately 15% of Americans between ages 20 and 69 may have permanent hearing loss from excessive noise exposure.²⁰

Noise is also associated with other problems besides hearing loss. Links between noise exposure and sleep disturbances, reduced productivity, and interference with learning are well documented. Cardiovascular effects (ischemic heart disease and hypertension) are weakly associated with long-term exposure to loud air and traffic noise. Many other adverse psychophysiological effects, such as hormonal, reproductive, and gastrointestinal changes, have also been reported in the literature, but data are too inconsistent to establish a definitive link with noise pollution.^{2,21,22,23,24}

HOW ARE WE TRACKING NOISE?

Noise is not tracked in the United States except in isolated cases. The Noise Control Act of 1972 gave the EPA enforcement authority to protect people from “noise that jeopardizes their health or welfare.”²⁵ In response, the EPA established the Office of Noise Abatement and Control (ONAC). The ONAC helped local municipalities develop noise codes and was preparing federal noise standards for transportation sources and construction machinery when funding ceased in 1981.²⁶ Since then, the Federal Aviation Administration and the Federal Highway Administration have implemented measures to track and control transportation noise,²⁷ and the National Institute for Occupational Safety and Health (NIOSH) has addressed occupational noise.²⁸ However, widespread noise tracking in communities does not exist. The U.S. Census Bureau collects information on noise via the American Housing



Figure 2. City-wide Noise Map for San Francisco.³⁵

Street Noise Level Ldn (dBA)

- 0.0 - 55.0
- 55.1 - 60.0
- 60.1 - 65.0
- 65.1 - 70.0
- 70+

Survey, but the data focus on people’s attitudes or sensitivity toward noise rather than on quantitative measurements of noise in communities.^{2,29}

One method of tracking noise involves mapping noise levels in defined geographic areas. Noise maps are not available for most U.S. cities.³⁰ In Europe, mapping of background noise levels in larger communities (with more than 250,000 residents) has been underway since 2002.^{31,32} Noise maps allow communities to identify problematic noise sources, take corrective action, and guide urban planning to reduce noise.

STATUS AND TRENDS FOR NOISE EXPOSURE

Information on the status and trends of noise in the United States is scarce, but basic data on noise levels generated by individual, everyday events are available (Table 2). Measurements of noise associated with transportation are collected around some single-source locations (airports, highways, etc.), but quantitative, community-wide noise-level data are limited to only a few locations. One of these is San Francisco, where researchers have developed a sophisticated map identifying the noisiest areas, building-by-building and hour-by-hour (Figure 2). Traffic has been found to contribute the most noise to the ambient noise level, but sirens, trains, exhaust fans, and other sources are also significant noise-generators.³³

WHAT YOU CAN DO

Noise exposure is the leading preventable cause of hearing loss.³⁷ By avoiding noise and wearing hearing protection in noisy areas, hearing loss can be prevented. Following are some steps you can take to reduce your exposure to noise:¹⁹

- Wear hearing protection when exposed to loud noises.
- Limit the time you are exposed to noise.
- Reduce the volume when listening to music.
- Choose quieter models when purchasing recreational equipment, household appliances, hair dryers, power tools, and toys.

ADDITIONAL RESOURCES

- The NIOSH Web site at www.cdc.gov/niosh/topics/noise/
- The American Speech-Language-Hearing Association (ASHA) Web site at www.asha.org/public/hearing/disorders/noise.htm

HEAT

Exposure to excessive heat is a well-recognized public health threat with the potential for community-wide effect. Heat waves claim lives, and scientists now expect more temperature extremes as part of global climate change.³⁸ Most of the United States is experiencing an overall warming trend,

and cities are especially vulnerable to increasing temperatures. As early as 1820, urban centers were noted to be warmer than more rural areas.³⁹ This urban temperature increase, now called the urban heat island (UHI) phenomenon, is accompanied by a range of secondary effects, including heat-related illnesses.

WHAT ARE THE HEALTH EFFECTS OF HEAT EXPOSURE?

Heat exhaustion and heat stroke are the most serious health effects associated with heat exposure, but excessive heat can also exacerbate pre-existing conditions, such as cardiovascular and respiratory diseases.⁴⁰ According to Centers for Disease Control and Prevention (CDC), a total of 7,415 heat-related deaths were reported between 1999 and 2010.⁴¹ Data show that mortality rates during a heat wave increase exponentially with the maximum temperature.⁴² Higher temperatures also accelerate ozone formation, which is associated with adverse health effects.

HOW ARE WE TRACKING HEAT?

Outdoor air and surface temperature data are available from many sources and have been collected in the United States for more than 100 years. Weather satellites, specially equipped aircraft, and local weather stations record temperatures throughout the nation. Sophisticated models have been developed to allow researchers to track temperature over time and space and to predict future trends.

STATUS AND TRENDS FOR HEAT EXPOSURE

Surface air temperatures in the United States have, on average, been increasing over the past century (Figure 3). A study of 50 cities across the country found the majority of cities experienced a mean temperature increase of 0.20°C (0.36°F) per decade during 1961 and 2010 (Figure 4). Rural areas just outside of the cities experienced a slightly lower mean temperature increase of 0.15°C (0.27°F) per decade.

With the trend toward higher temperatures in the United States, the UHI effect has also become more pronounced in some cities, particularly those in the South.⁴⁴ Among the 50 cities identified in Figure 4, twenty-nine recorded an increased UHI effect

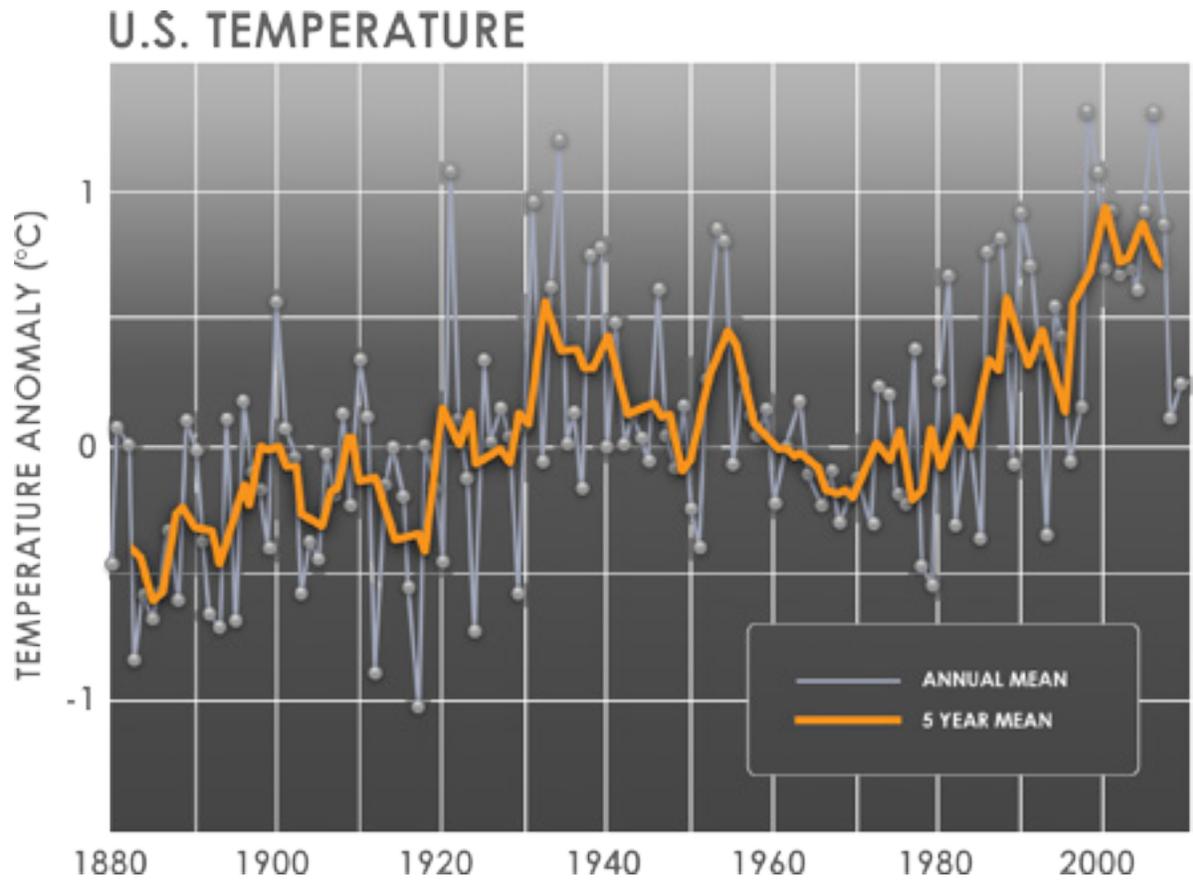


Figure 3. Annual and 5-year running mean surface air temperature in the contiguous 48 United States, 1880-2012.⁴³

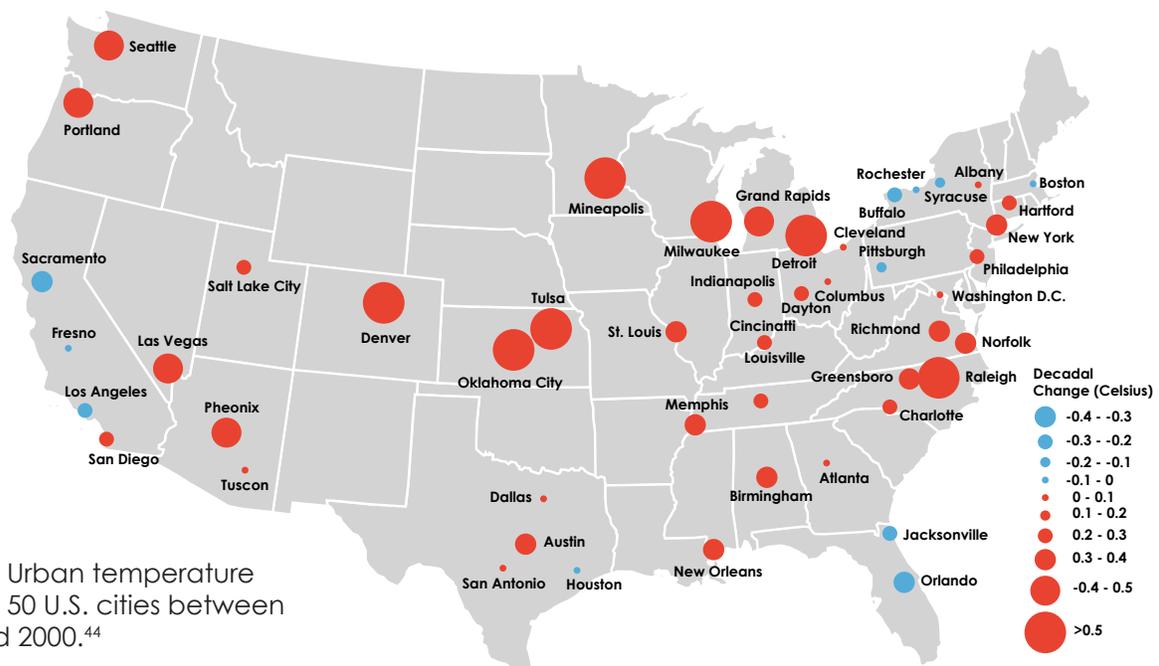


Figure 4. Urban temperature trends in 50 U.S. cities between 1951 and 2000.⁴⁴

between 1961 and 2010, with an average temperature increase of 0.31°C (0.56°F) per decade, or 3°C (5.4°F) per century.⁴⁵

A typical profile for the UHI effect is illustrated in Figure 5. Surface and atmospheric temperatures vary over different land use areas. Surface temperatures vary more than air temperatures during the day, but they both are fairly similar at night. The dip and spike in surface temperatures over the pond show how water maintains a fairly constant temperature day and night due to its high heat capacity.⁴⁵

WHAT YOU CAN DO

Individuals and the larger community can take measures to reduce human exposure to extreme heat. On an individual level, you can do the following:

- Try to stay in air-conditioned buildings. If your home is not air-conditioned, seek air-conditioned public facilities, such as libraries and community centers.
- Wear light-colored clothing, and try to stay in the shade if you must be outside. Light colors reflect radiation, which will keep you cooler.
- Do not leave children in cars. Even with the windows slightly open, cars can heat up to dangerously hot temperatures very quickly.

ADDITIONAL RESOURCES

- The CDC Web site on extreme heat at www.bt.cdc.gov/disasters/extremeheat/
- The EPA has a Web site on the heat island effect at www.epa.gov/heatisland/
- The National Oceanic and Atmospheric Administration's National Weather Service Web site at www.nws.noaa.gov/
- The Federal Emergency Management Agency (FEMA) Web site at www.fema.gov/hazard/heat/index.shtm

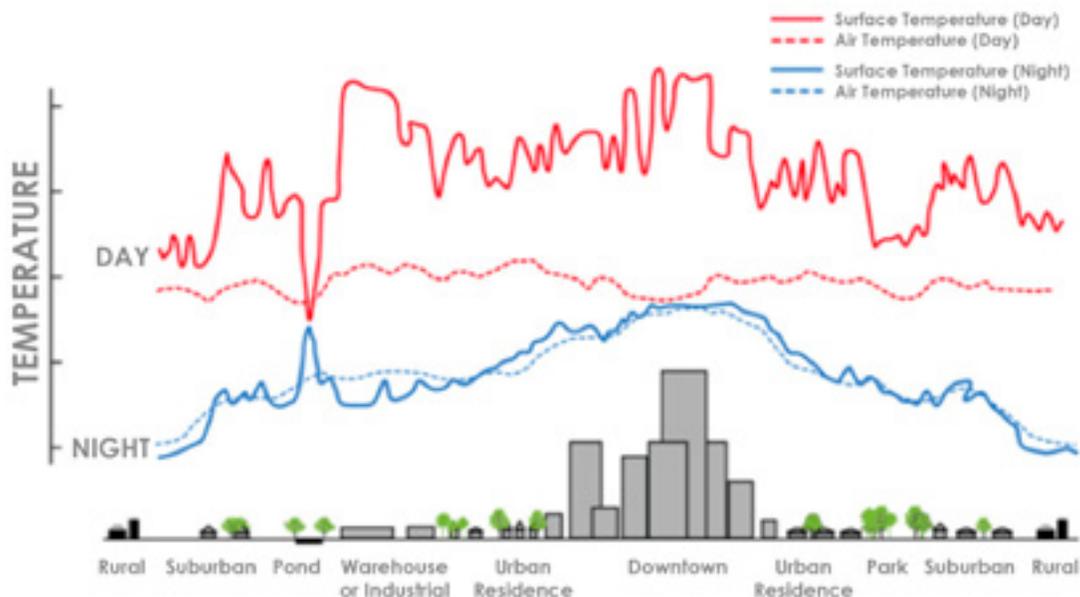


Figure 5. An example of surface and atmospheric trends in a city.⁴⁵

* Note: The temperatures displayed above do not represent absolute temperature values or any one particular measured heat island. Temperatures will fluctuate based on factors such as seasons, weather conditions, sun intensity, and ground cover.

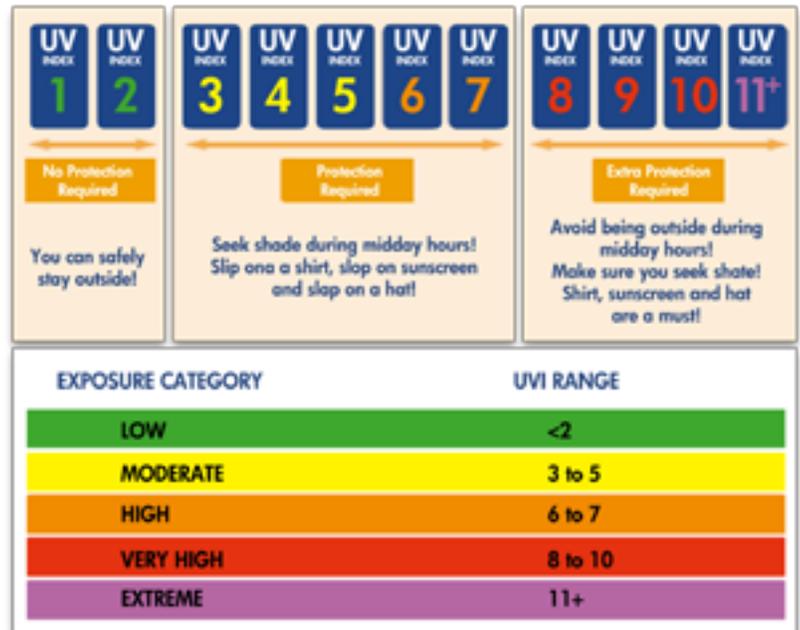
ULTRAVIOLET LIGHT RADIATION

Ultraviolet (UV) light radiation is part of sunlight. Atmospheric components, notably stratospheric ozone, filter out some UV radiation, but enough reaches the earth's surface to cause both beneficial and detrimental health effects. Small amounts of UV radiation are required for production of vitamin D, an essential vitamin that prevents rickets. Overexposure to UV radiation, however, is known to cause adverse health effects, such as sunburn and skin cancer. Although the sun is the strongest UV source in our environment, some man-made tools and lamps also produce UV radiation (e.g., electric welding arcs, tanning lamps, UV lasers, and some lighting). On the earth's surface, the intensity of UV radiation from the sun increases with altitude and proximity to the equator.

WHAT ARE THE HEALTH EFFECTS OF ULTRAVIOLET LIGHT RADIATION EXPOSURE?

Overexposure to the sun's rays can cause skin damage, with effects ranging from sunburn and wrinkling to skin cancer. Peoples' behavior in the sun is believed to be a major contributor to the rise in skin cancer rates over the last few decades. The human eye is also sensitive to UV overexposure. Inflammation of the cornea and conjunctiva (more commonly known as snow blindness and welder's flash) can occur, and UV sometimes contributes to the development of cataracts and macular degeneration, a medical condition characterized by loss of vision in the central visual field.

Figure 6. The UVI and recommended protective measures.⁴⁸



HOW ARE WE TRACKING ULTRAVIOLET LIGHT RADIATION?

A number of monitoring networks measure solar UV radiation at various stations across the United States.⁴⁶ Sophisticated instruments record ground level UV radiation, and these measurements are used to verify and refine models that forecast UV radiation levels for at least one urban center in every state. The nation has tracked UV radiation levels for about 20 years.



STATUS AND TRENDS FOR ULTRAVIOLET LIGHT RADIATION EXPOSURE

The World Health Organization (WHO), in collaboration with the World Meteorological Organization (WMO) and other international groups, has developed a Global Solar UV Index (UVI), a simple measure of solar UV radiation at the earth's surface (Figure 6). This same UVI scale is used by the U.S. National Weather Service to calculate a daily UVI for each area of the United States. The UVI varies during the day, but the maximum occurs during a 4-hour period around solar noon. Some weather forecasts, particularly in the summer, report the maximum UVI expected each day. WHO considers a UVI of 2 or lower to be safe.⁴⁷

In the United States, the northern states receive less intense sunlight and thus have lower UV radiation. In 2006, for example, the southern United States exceeded a UVI of 2 more than 200 days each year, whereas most northern states exceeded the limit fewer than 200 days of the year (Figure 7). The annual number of UVI-unsafe days in selected U.S. cities did not vary significantly from year to year during the period 1996–2006.⁴⁸

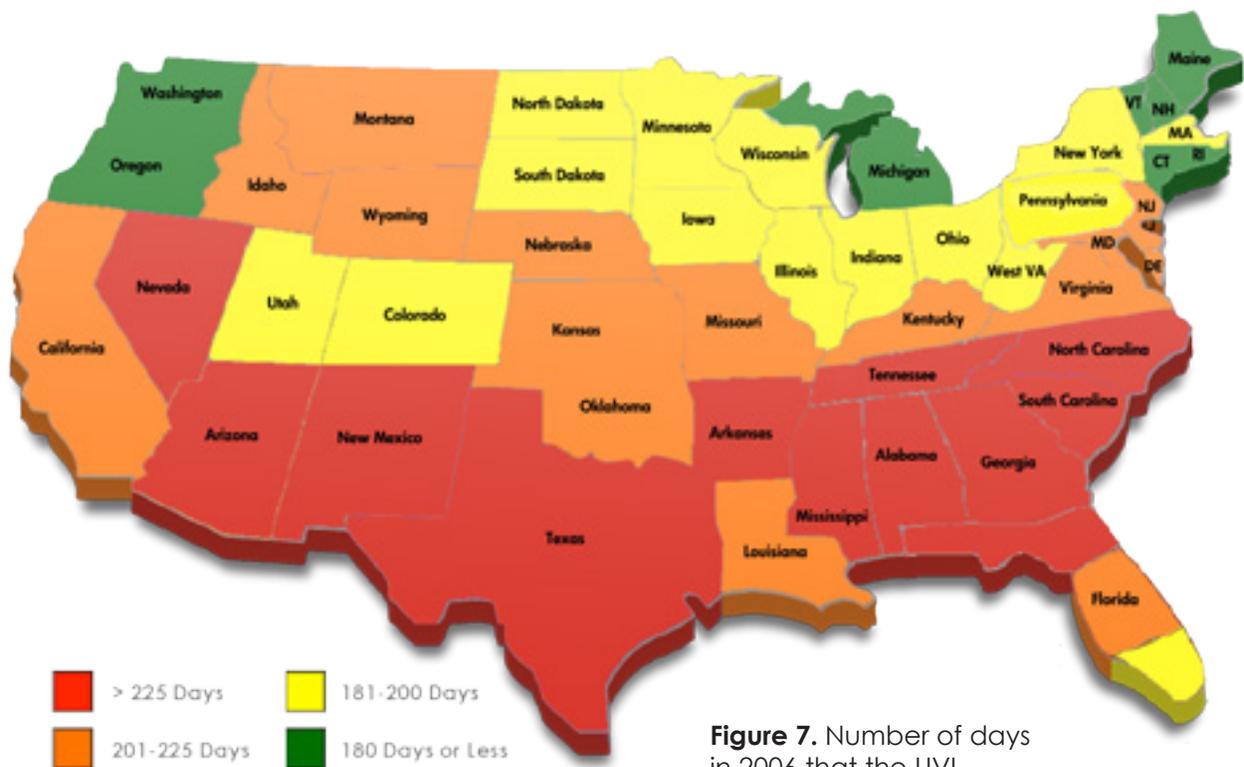


Figure 7. Number of days in 2006 that the UVI exceeded the WHO safe threshold of 2.⁴⁸

WHAT YOU CAN DO

Preventing overexposure to UV radiation is relatively simple and can greatly reduce your risk of sun-related conditions.^{49,47} Find out the UVI each day from television, radio, newspaper, or Internet, and if it is 3 or greater, stay out of the sun during midday. If you must be in the sun, take the following protective measures:

- Wear protective clothing, such as long-sleeved shirts.
- Wear a broad-brimmed hat and sunglasses, preferably wraparound sunglasses or sunglasses with side panels.
- Generously apply sunscreen that has a sun protection factor (SPF) of 15 or greater.
- Use extra caution near highly reflective surfaces, such as water, snow, and sand.

Note that sunscreen should not be used to extend your time in the sun. Do not allow yourself to become sunburned, and do not use tanning beds.

Babies and young children are especially susceptible to overexposure. When outside, keep them in the shade, or screen them from direct sunlight.

ADDITIONAL RESOURCES

- Centers for Disease Control and Prevention (CDC) Basic Information About Skin Cancer www.cdc.gov/cancer/skin/basic_info/
- The U.S. Environmental Protection Agency's SunWise program is a health and environmental education program that teaches children and their caregivers how to protect themselves from overexposure to the sun www2.epa.gov/sunwise.
- National Cancer Institute's (NCI) Information on Melanoma includes information about detection, symptoms, diagnosis, and treatment of melanoma, as well as skin cancer statistics, research, and clinical trials www.cancer.gov/cancertopics/types/melanoma.
- NCI's What You Need to Know About Skin Cancer www.cancer.gov/cancertopics/wyntk/skin/.
- The National Council on Skin Cancer Prevention is comprised of more than 45 organizations whose staffs have experience, expertise, and knowledge in the area of disease prevention and education www.skincancerprevention.org/

- The Global Solar UV Index, provided by the U.S. Environmental Protection Agency (EPA) in partnership with the National Weather Service (NWS), includes UV index forecasts for 58 U.S. cities from NWS and allows Internet users to check UV forecasts by ZIP code www.epa.gov/sunwise/uvindex.html.
- National Institutes of Health (NIH): Skin Cancer <http://nihseniorhealth.gov/skincancer/toc.html>.
- NIH: Skin Care and Aging www.nia.nih.gov/health/publication/skin-care-and-aging.
- Food and Drug Administration (FDA):
 - o Sunscreen www.fda.gov/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/UnderstandingOver-the-CounterMedicines/ucm239463.htm.
 - o Indoor Tanning www.fda.gov/ForConsumers/ConsumerUpdates/ucm186687.htm.
- The World Health Organization's "Ultraviolet Radiation" site www.who.int/uv/en/.

ADDITIONAL RESOURCES FOR COMMUNITY ENVIRONMENTAL HAZARDS

- Centers for Disease Control and Prevention (CDC) at www.cdc.gov/healthyplaces/
- National Environmental Health Association (NEHA) at www.neha.org/research/landuseplanning.html
- National Association of City and County Health Officials (NACCHO) at www.naccho.org/topics/environmental/landuseplanning/
- Environmental Protection Agency (EPA), Smart Growth website at www.epa.gov/dced/
- Robert Wood Johnson Foundation (RWJF) at www.activeliving.org/

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